reference and the Lew et al. reference fail to teach and fail to suggest the invention as claimed

The Examiner takes the position that Cage et al. presents a teaching suggesting a manifold with a predetermined rise angle which is the same as the angle at joint ends. The Examiner refers to column 3, lines 38-42. Applicant notes that Cage et al. certainly teaches a manifold having two manifold outlets (on the inlet manifold) and two manifold inlets on the outlet manifold side. The manifold inlet is at an angle which is at the same as the manifold outlet. However, with Cage et al. there is no issue with regard to this set up as Cage disclose U-tubes with straight or linear tube portions at the interface with the manifolds. Further, the statement at column 13, lines 38-41 simply indicates that each manifold can be adapted to receive or discharge fluid in a direction substantially in parallel or at an angle to the ends of the flow conduits. This is a statement that the manifold angle may be different from the flow tube conduit. This does not provide any suggestion or teaching as to the criticality and desirability of providing a manifold connection at an angle that is the same as a flow conduit angle wherein the flow conduit is part of a single bend arch structure. Further, the discussion at column 13 lines 30-34 that the U-shaped flow conduits may be replaced by other shapes, does not provide any teaching or suggestion as to the desirability or the criticality of using a single bend arch wherein the ends are at a particular angle and the manifold matches this angle. The Cage et al reference is simply lacking in any suggestion or teaching as to the desirability of this feature Particularly the rejection at page 3, lines 2-5 is not supported by the teachings of the prior art and therefor the rejection should be reconsidered. Similarly, with regard to claim 5 the Examiner states that Cage et al. discloses inlet ports and outlet ports of an entry side manifold

(and similar for the exit side manifold) wherein the manifold has a smooth curve. This is cle not taught and clearly not suggested by Cage et al.. Cage et al. simply has a manifold v outlets and notes that the connection can be at an angle with respect to the direction of tubes (column 13 lines 38 - 41). This does not provide a teaching or suggestion as to provic a manifold which is formed of passages that have a smooth curve. Cage et al. does not sh this and does not suggest this and the passage supports Applicant's position and does : support the rejection. Cage et al. simply does not teach or suggest a passage in the manif which is a smooth curve from an inlet port to outlet ports and does not suggest this for the e manifold either. Cage et al. clearly discloses a manifold which has an exit opening which is a right angle to the manifold intake. No smooth curve is provided and no smooth curve suggested. If this connection is instead at an angle to the tube 11, there is no provision fo smooth curve. Also, another feature of the invention would not be met by the Cage et : connection of the tube 11 to the manifold 12. In fact the referenced passage at column 13 lin 38 - 41 directs the person of ordinary skill in the art to the possibility of having the tub connect to the manifold at an angle relative to each other. This is directing the person ordinary skill in the art away from the invention.

The Lew et al. reference is cited for teaching tubes of the substantially arched shap However, the continuous curvature of Figure 5 provides a multiple bend curve, a particula feature which is particularly not a part of the invention as claimed. Accordingly, Lew et al. doe not teach the feature for which it is cited. Applicant notes that flow meters having an arcl shape per se exist in the prior art as discussed in the application and for example as shown i

U.S. 5,796,011 which has been recently cited in the European Patent Office Search Report. A copy of this U.S. Patent is attached for consideration by the Examiner. However, as noted, in such arch shaped flow meters, the connection of the arch shaped structure has been with a double bend as per Lew et al. and also Figure 5 of U.S. 5,796,011. It appears that Figure 1 of U.S. 5,796,011 has a manifold with inlets and outlets which are at an angle relative to the angle of the joint ends of the arch tubes. This is somewhat similar to what Cage et al. is discussing at column 13 lines 38 - 41. In either case, the features of the invention are not suggested and in fact the prior art as a whole directs the person of ordinary skill in the art away from the invention in the various teachings including Cage et al., Lew et al. and U.S. 5,796,011.

The Examiner takes the position that a variation in a shape of an element that constitutes a known apparatus is "merely a design choice". Applicant notes that a variation in shape can be a design choice where the variations are not critical or wherein the variations are known. For example, selecting the color of the tube as a silver color or a black color could be a design choice if such a choice is not critical. However, particular shapes, colors and other selection of features can provide a critical distinction and provide a patentable difference as to the prior art. Accordingly, the general statement made by the Examiner is not correct. Further, the discussion of Cage at column 13 lines 30 - 33 is simply an indication that other shapes may be available. However, this is not a teaching of the desirability of a particular shape and does not provide a teaching or motivation to the person of ordinary skill in the art to adopt a particular shape. An invitation to experiment does not provide a suggestion of a particular desirable feature or shape.

Applicant notes that the Examiner's statement in the response to arguments is also n a proper statement of U.S. patent law. The Examiner states that "a mere variation in the sha of some elements that compose a known apparatus is not germane of patentability." Howeve there is no test for patentability which involves anything regarding changes in shape. Questio of patentability involve the issues as to whether an invention is novel and unobviou Obviousness relates to the considerations as to the teachings of the prior art and what they lea and motivate the person of ordinary skill in the art to do. Where a particular shape can provid an improvement and wherein there is no suggestion of the particular shape in the prior art, th shape consideration may lead to a patentable invention. In any event, Applicant's inventio involves a combination of features including aspects relating to shape. Absent a suggestion c teaching in the prior art to provide the combination, the combination is novel and unobviou:

As stated in the application with reference to Figure 5, Coriolis mass flow meters of curve tube type such as disclosed in Cage et al. measure the oscillation of the proximal part (the straight parts of tube 11 in Cage et al.). This is the portion of the flow tubes that exten in the lateral direction from the tubular body. In such arrangements it is necessary to provid a length needed for measurement of the proximal parts of the flow tubes which extend in th lateral direction. This clearly leads to an increase in size of the meter. Certainly advantage relating to the size of the overall structure and the ability to manufacture a structure can b considered critical features which when improved lead to improvements in the state of the ar as a whole.

A coriolis mass flow meter having two parallel flow tubes forming an arch shape whicl

is curved into such an arch shape can solve the problem as to the need for extensive lengt
the proximal areas of the U-shape arrangement such as Cage et al.. Specifically, the Cag
al. problem with regard to the overall size of the meter can be addressed by providing a
shaped tubes. However, as stated in the discussion in the application with reference to Fig
6, such flow tubes can involve more than three bending steps. This adds significant costs to
production and is unfavorable as the dual tube construction requires symmetry. This can l
to either difficulties in function or high cost in production. Figure 6(b) illustrates the two sta
of the vertically oscillating flow tubes. As shown, the nodes of oscillation that would have be
fixed by a face plate are also subjected to oscillation, making accurate measurement diffic

The present invention addresses these various problems. The invention avoids t
problems of the coriolis mass flow meter of a curve tube U-shape type as disclosed by Cage
al. and avoids the problems of the arch shape.

It should be apparent from the above that the coriolis mass flow meter of the curve tul
U-shape type as per Cage et al. does not have the problems of the arch shape type. For the U
shape tube the linear proximal parts for oscillating and measuring are not bent, they are straigl
such that the bending problems of the arch shape tubes are not provided. However, b
providing this advantage, the structure of Cage et al. has the disadvantage as to the overall size

The structure disclosed in the Lew et al. reference requires the complex bendin
process.

The flow tubes of the present invention are critical as to the oscillation measurement
This differs from Cage et al. where the bent structure is oscillated but is not critical to the

oscillation measurement. However, with the invention, the flow tubes which are bent and ar used for measurement are made into a simple one-way curved construction.

The complex structure involving the change of flow paths from the two flow tubes i provided by the extending flow paths realized by the inlet and exit manifold. Neither Cage e al. nor Lew et al. teach or suggest this combination.

A U-shape tube type utilizing the oscillation of the linear proximal parts (as per Cag et al.) and the arch shape type oscillated coriolis mass flow meters, that utilize the oscillatio on the whole flow tube, are quite different structures and operate under different operatin principles. For this reason in particular, the selection of pieces from Cage et al. in an attemp to combine them with pieces from Lew et al. does not lead to the invention as claimed and i not suggested to the person of ordinary skill in the art. If the flow tube disclosed by Cage i modified to form an arch shape type it becomes a quite different flow tube from the one tha Cage et al. intended. Even with Cage et al.'s statement as to the ability to use different shapes such a change in shape would be a significant departure from what is taught by Cage et al. Cage et al.'s suggestion as to different shapes is at best an invitation to experiment. A perso of ordinary skill in the art would have difficulties in combining the techniques of a U-shape tube type with an arch shape type.

Accordingly, Applicant respectfully requests that the Examiner reconsider the rejectio of the claims as presented.

Applicant also respectfully requests that the Examiner consider the attached referenc which has recently come to Applicant's attention as a result of a European Search Report

namely U.S. 5,796,011. This reference is also listed in the attached 1449 form.

Further and favorable action on the merits is respectfully requested.

Respectfully submitted
for Applicant,

By: _____
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JJM:jj/cla/tf
68596.9

Enclosed: Marked-Up Version of the Claim 1
PTO-1449 form
copy of U.S. 5,796,011

DATED: June 10, 2002
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SHOULD ANY OTHER FEE BE REQUIRED, THE PATENT AND TRADEMARK OFFIC IS HEREBY REQUESTED TO CHARGE SUCH FEE TO OUR DEPOSIT ACCOUNT 13 0410.

VERSION OF THE CLAIM SHOWING CHANGES

1. (Twice Amended) A Coriolis mass flow meter[having], comprising:

two parallel flow tubes curved into an arch shape having joint ends[,];

an entry-side manifold that is connected to one set of said joint ends of said two flow tubes and branches a fluid being measured from an inlet port into said two flow tubes[,];

an exit-side manifold that is connected to another set of said joint ends of said two flow tubes and converges flows of said fluid being measured flowing in said two flow tubes into an outlet port to discharge said fluid being measured[,];

a drive unit for driving and resonating one of said flow tubes with another of said flow tubes at mutually opposite phases[,]; and[ ]

a pair of oscillation sensors installed along said two parallel flow tubes curved into an arch shape at locations horizontally symmetrical with respect to an installation location of said drive unit for sensing a phase difference proportional to a Coriolis force, said [mete comprising;

said]two flow tubes [which are]being connected to [the]said entry-side manifold and [the]to said exit-side manifold at [the]respective said joint ends [respectively,]and said two flow tubes being formed into the arch shape that is bent in only one direction[, and

], said entry-side [and exit-side manifolds being connected to said flow tubes at said joint ends at a predetermined rise angle in a same direction as said flow tubes,

wherein a change of flow paths from the two flow tubes to external piping is addressed by flow paths in the manifolds being smoothly bent]manifold having two manifold outlets smoothly bent, from an inlet of said entry-side manifold [and]to a connection to said flow tubes at said joint ends, at a predetermined rise angle that is the same as the angle of the said joint ends, said exit-side manifold having two manifold inlets smoothly bent, from an outlet of said exit-side manifold to [the joint ends connecting to said two flow tubes.

]a connection to said flow tubes at said joint ends, at a predetermined rise angle that is the same as the angle of the said joint ends.